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RESEARCH SUMMARY

forest sciences
NELSON FOREST REGION

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Screening Trial for Herbicides Used for Repression Spacing in Lodgepole Pine

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- **Release® reduced average stocking from 80 000 sph to 11 867 sph**
- **Water was an effective carrier.**

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INTRODUCTION

Large areas of the 1985 wildfires in the Invermere District regenerated to excessive densities of primarily lodgepole pine. These densities, which often exceed 40 000 stems per hectare (sph), must be spaced to about 2 000 sph before they can be expected to produce sawlogs within a reasonable period. Various methods have been tried, including hand-pulling, hand-held power tools, large ploughs, etc., all of which produced unsatisfactory results, with either too much site disturbance (mostly compaction, but with some LFH displacement), or too many trees left behind. Killing unwanted trees with herbicides would cause little site disturbance, and, if done aerially, could treat sites that were unworkable with machinery.

Early stocking reduction may be more desirable than later treatment. Early treatments would likely be less expensive and would be conducted before repression set in. Later treatment would likely be more expensive and would be conducted on trees that were repressed. As envisaged in this trial, chemical spacing would be conducted before repression set in.

OBJECTIVE

To test two herbicides (Vision® and Release®) in three formulations for repression spacing in excessively dense lodgepole pine.

METHODS OF INVESTIGATION

Location

One location in the Lussier River drainage, burned by a 1985 wildfire, was selected for the study. Seedling density on the study site ranged from 8 000 to 240 000 sph, with a mean density ranging from 72 881 sph in the control to 87 300 sph in the Vision® treatment.

Description of Treatments

Three herbicide treatments plus a no-treatment control were tested. These were:

- Vision® in Water, applied at the rate of 6 litres (product) in 100 litres carrier per ha.
- Release® in Water, applied at the rate of 8 litres (product) in 100 litres carrier per ha.
- Release® in Oil, applied at the rate of 8 litres (product) in 100 litres carrier per ha, using mineral oil as carrier
- Control (no treatment).

All rates used were the maximum label rates at the time the trial was started.

All treatments were ground applications using backpack sprayers. They were conducted on July 6, 1994, while the pine were still actively growing, after needle development started for the current year, but before full cuticular development. Hi-lite dye was added to all spray mixes to aid visibility. Weather during application was dry, warm (12°C), and calm, with a high overcast. No rain fell during the 12 hours after treatment.

Layout

The trial was laid out as a completely randomized block, with three replications of each of the four treatments.

One 0.48 ha (100 x 48 m) block was divided into twelve strips 3 m wide and 100 m long, with a buffer of 1 m between each strip. Treatments were randomly applied to each strip. Twenty 5 m^2 assessment plots ($r = 1.26$ m) were established along the centre of each strip, starting 2.5 m from the end, and located every 5 m.

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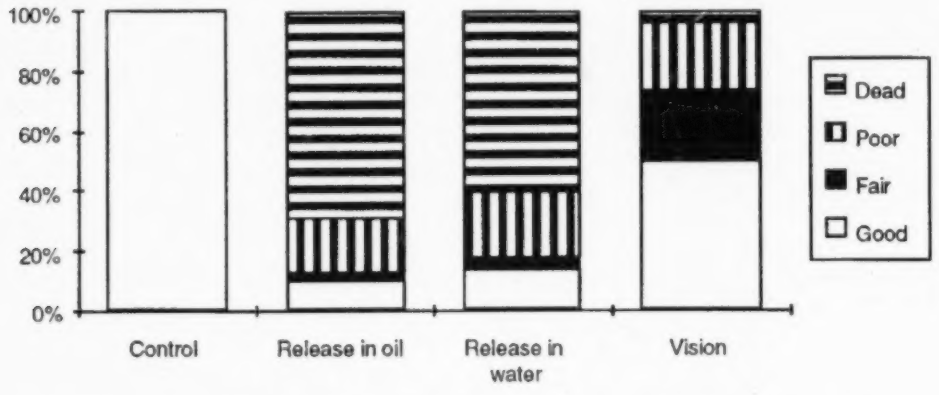

Figure 1. Percentage distribution of trees among condition classes, two growing seasons after treatment.

Measures

Every seedling in every plot was counted. Assessments were conducted before the spray in spring 1994, and in fall 1995. The post-treatment assessment also assessed the herbicide damage by categorizing the seedlings into condition classes. These were: DEAD, POOR (>80% necrotic foliage), FAIR (20 - 80% necrotic foliage), and GOOD (<20% necrotic foliage). Poor trees often had as few as two green needles but with a green moist cambium up to the position of the needles. The trees classed as Dead occasionally had green cambium, but it was restricted to below the lowest branch. In all cases, Poor trees had dead leaders, while some Fair trees still had green leaders and continued to grow after treatment. All trees in the Good class grew after treatment, although some in the Fair class appeared to have grown at a reduced rate.

Table 1. Percentage distribution of trees among condition classes, two growing seasons after treatment. Means in the same column followed by the same letter are not significantly different (α=0.05).

	CONDITION CLASSES			
	Good	**Fair**	**Poor**	**Dead**
Control	99.95a	0.05b	0.00b	0.00b
Release® in oil	10.27c	1.74b	19.11a	68.87a
Release® in water	13.39c	4.04b	22.51a	60.06a
Vision®	49.52b	23.25a	22.79a	4.43b

RESULTS

Large differences were evident. Release® in either carrier caused considerable mortality (60 - 69%), in contrast to less than 5% mortality in the Vision® treatment (Table 1).

In contrast, Vision® weakened more trees than Release®, as shown by the percentage of trees in Fair condition. All three chemical treatments resulted in about 20% of the trees in the Poor category. Results are shown graphically in Figure 1.

DISCUSSION

If we assume that the trees in Fair condition will survive, and that the trees in Poor condition will die (or make negligible contribution to stocking), the net result is 83 - 88% effective mortality using Release® and only 27% effective mortality using Vision®.

Even with these levels of mortality, the stocking of Good and Fair trees in the Release® treatments ranged from 0 to 58 000 sph, with a mean between 9 200 and 14 533 sph. In the most effective treatments, between 37 and 60% of the plots have over 10 000 sph. Obviously, portions of this area are still too dense to meet management objectives.

The underlying objective of this trial was to determine if complete lodgepole pine mortality could be achieved using herbicides. If it was possible, a modified application technique was envisaged as the method of controlling the distribution of mortality. Obviously, a complete kill was not achieved here. The survivors in the most effective treatment might be the product of the application method. It is very difficult to achieve complete coverage using ground application if ground irregularities or obstacles obstruct applicator movement. On the test site, post-

fire snag falling had produced frequent obstacles that would have impeded applicator movement. Perhaps, with aerial application, coverage would be more uniform, and mortality more complete. Variations in phenological condition may also influence the effect. When treated, tree leaders averaged about 75% extended, with current needles about 50% developed, with considerable variation about the mean condition. This variation could have affected the uniformity of response.

Operational application of chemical spacing using Release® is not immediately recommended as a result of this trial. The technique does offer operational potential, but there are still many unanswered questions. For example, can these levels of effect be achieved in another year, or on a larger scale? Can more complete mortality be achieved using aerial application? Did we test the optimal application rate? How large is the application window? Is hand-thinning feasible following a broadcast application such as this? Can Release® be applied aerially, possibly using a modified boom and cross-flying to produce mortality levels and distribution in which operational hand-spacing can be carried out effectively? What would a complete spacing system cost? No costs were recorded in this trial as the study was so small, and any costs would not be representative of operational-scale costs.

These questions suggest the need for additional trials that would explore the complete system from excessively stocked to well-spaced stand. Opportunities also exist to explore the rate and effective window of application for Release® treatments. Currently, no further studies are proposed.

CONCLUSIONS

Ground application of Release® at 8 litres (product) per ha effectively reduced lodgepole pine densities from an average of 80 000 sph to an average of 11 867 sph.

Water and oil were equally effective as carriers for the Release® treatment.

Vision® at 6 litres (product) per ha was not effective.

RECOMMENDATIONS

Additional testing is required before recommending Release® for repression spacing. These tests should compare application methods. The methods should probably include ground broadcast application (as used in this test), together with single and double (cross application) aerial application possibly using a through valve boom, probably with some valves disabled.

Future testing should be conducted on an operational scale.

All future trials should include follow-up manual spacing to test a complete spacing system.

Water (as the carrier that is easier to use) is the carrier of choice.

Additional trials are required to determine the length of the effective treatment window and also the most cost-effective application rate.

FOR MORE INFORMATION CONTACT

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